UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Ex parte C. ALEXANDER TURNER JR.

Appeal No. 2004-2055
Application No. 09/691,343

ON BRIEF

Before WILLIAM F. SMITH, SCHEINER, and GRIMES, Administrative Patent Judges.

GRIMES, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal under 35 U.S.C. § 134 from the examiner's final rejection of claims 4-11, all of the claims remaining. Claims 4 and 6 are representative and read as follows:

4. An isolated nucleic acid molecule comprising at least 24 contiguous bases of nucleotide sequence first disclosed in the NHP gene described in SEQ ID NO:6.

6. An isolated nucleic acid molecule comprising a nucleotide sequence that encodes the amino acid sequence shown in SEQ ID NO: 7.

The examiner relies on the following references:

Tischer et al. 5,194,596 Mar. 16, 1993

Wells, "Additivity of Mutational Effects in Proteins," Biochemistry, Vol. 29, No. 37, pp. 8509-8517 (1990)

Skolnick et al., "From Genes to Protein Structure and Function: Novel Applications of Computational approaches in the Genomic Era," Trends in Biotechnology," Vol. 18, pp. 34-39 (2000)

Yan et al., "Two-Amino Acid Molecular Switch in an Epithelial Morphogen That Regulates Binding to Two Distinct Receptors," Science, Vol. 290, pp. 523-527 (2000)

Claims 4-11 stand rejected under 35 U.S.C. §§ 101 and 112, first paragraph, as lacking patentable utility.

Claims 4, 7, and 8 stand rejected under 35 U.S.C. § 112, first paragraph, as not enabled throughout their scope.

Claim 4 stands rejected under 35 U.S.C. § 112, first paragraph, as lacking an adequate written description in the specification.

We reverse the rejection for lack of written description, affirm the rejections for lack of utility, and do not reach the scope-of-enablement rejection.

Background

The specification discloses a cDNA (SEQ ID NO:6) encoding a putative human protein (SEQ ID NO:7), generically referred to as an NHP (for "novel human protein"), that

> shares structural similarity with animal proteins that contain CUB domains. The CUB domain is an extracellular domain (ECD) present in [a] variety of diverse proteins such as bone morphogenetic protein 1, proteinases, spermadhesins, complement subcomponents, and neuronal recognition molecules. The described NHP also displays significant similarity with bone morphogenic protein, neurophilin and vascular endothelial growth

> factor. As such, this novel sequence represents a new member of the platelet-derived growth factor/VEGF family of proteins.

Pages 2-3. See also pages 7-8:

> In addition to the genes encoding PDGF and VEGF family proteins, the NHPs [sic] described in SEQ ID NO:7 shares significant similarity to a variety of CUB domain proteins such as bone morphogenetic protein, C-proteinases and endopeptidases, neuropilin, human NP-2, semaphorin, sperm adhesins, bovine acidic seminal fluid protein, and other secretory proteins. The described open reading frames [sic] also contain a polymorphism including an A to G transition at base 598 of SEQ ID NO:6 which converts the isoleucine at position 200 of SEQ ID NO:7 to a valine.

The specification does not disclose what role the disclosed NHP plays in any physiological process, but contemplates "the use of the described NHP nucleotides, NHPs, and peptides, as well as antibodies . . ., other antagonists that inhibit binding activity or expression, or agonists that activate NHP receptor activity or increase NHP expression, in the diagnosis and/or treatment of disease." Page 5. For example, the specification discloses that "suitably labeled NHP nucleotide probes may be used to screen a human genomic library using appropriately stringent conditions or by PCR. The identification and characterization of human genomic clones is helpful for identifying polymorphisms, determining the genomic structure of a given locus/allele, and designing diagnostic tests." Page 10.

The NHP protein is disclosed to have "a variety of uses. These uses include, but are not limited to, the generation of antibodies, as reagents in diagnostic assays, for the identification of other cellular sequence products related to a NHP, [and] as reagents in assays for screening for compounds that can be [used?] as pharmaceutical reagents useful in the therapeutic treatment of mental, biological, or medical disorders and disease." Page 14.

The specification discloses that NHP-binding antibodies "may be used, for example, in the detection of NHP in a biological sample and may, therefore, be utilized as part of a diagnostic or prognostic technique whereby patients may be tested for abnormal amounts of NHP. . . . Such antibodies may additionally be used as a method for the inhibition of abnormal NHP activity. Thus, such antibodies may, therefore, be utilized as part of treatment methods." Pages 23-24.

Finally, the specification contains a section headed "Screening assays for compounds that modulate NHP expression or activity" (pages 35-52); this section includes the following subsections: "In vitro screening assays for compounds that bind to NHPs" (pages 42-44); "Assays for intracellular proteins that are activated by NHP binding" (pages 44-47); and "Assays for compounds that interfere with NHP receptor/intracellular or NHP/transmembrane macromolecule interaction" (pages 47-52). No working examples are provided to show the effect of any particular compound on the activity of the NHP of SEQ ID NO:7.

Discussion

The examiner rejected the claims for lack of utility sufficient to satisfy 35 U.S.C. § 101 (all the claims);[1] for lack of enablement throughout their scope (claims 4, 7, and 8), and for lack of an adequate description in the specification (claim 4).

1. Written description

Claim 4 is directed to a nucleic acid molecule comprising at least 24 contiguous bases of the sequence of SEQ ID NO:6. The examiner rejected claim 4 for lack of

[1] The examiner also rejected all of the claims under 35 U.S.C. § 112, first paragraph, for lack of enablement, but that rejection is merely as a corollary of the finding of lack of utility. See the Examiner's

adequate written description, on the basis that the claimed nucleic acid "encompass[es] gene sequences from other species, mutated sequences, allelic variants, splice variants and so forth. . . . [Claim 4] encompasses virtually any random sequence of any length as long as it has a stretch of at least 24 consecutive nucleotides that is the same as SEQ ID NO:6." Examiner's Answer, page 8.

The examiner correctly noted that claim 4 is directed to a genus of nucleic acids, and applied the appropriate test from University of California v. Eli Lilly & Co., 119 F.3d 1559, 43 USPQ2d 1398 (Fed. Cir. 1997). She concluded that

> [d]ue to the breadth of the claim[ed] genus and lack of the definitive structural or functional features of the claimed genus, one skilled in the art would not recognize from the disclosure that Appellant was in possession of the claimed genus. Therefore, only SEQ ID NO:6 but not the full breadth of the claims meet the written description requirement of 35 USC 112, first paragraph. The species specifically discloses are not representative of the genus because the genus is highly variant.

Examiner's Answer, page 10.

We will reverse this rejection. The written description requirement of 35 U.S.C. § 112, first paragraph, does not require a description of the complete structure of every species within a chemical genus. See Utter v. Hiraga, 845 F.2d 993, 998, 6 USPQ2d 1709, 1714 (Fed. Cir. 1988) ("A specification may, within the meaning of 35 U.S.C. § 112, ¶ 1, contain a written description of a broadly claimed invention without describing all species that claim encompasses.").

This standard applies to DNA as well. "A description of a genus of cDNAs may be achieved by means of a recitation of a representative number of cDNAs, defined by

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Answer, page 6, second full paragraph. Therefore, our conclusion with respect to the § 101 issue also applies to this § 112 issue.

nucleotide sequence, falling within the scope of the genus or of a recitation of structural features common to the members of the genus, which features constitute a substantial portion of the genus." Eli Lilly, 119 F.3d at 1568, 43 USPQ2d at 1406.

Here, we agree with Appellant that the genus defined by claim 4 is adequately described in the specification. The genus of nucleic acids encompassed by claim 4 is defined by the structural feature recited in the claim. All of the members of the claimed genus share the recited structural feature, which is described in the specification since the full sequence of SEQ ID NO:6 describes all of its possible 24-nucleotide subsequences. We agree with Appellant that the specification adequately describes structural features that are common to members of the genus, and which allow one skilled in the art to visualize or recognize the members of the genus. Cf. Eli Lilly, 119 F.3d at 1568, 43 USPQ2d at 1406.

The examiner has not adequately explained why a more detailed description of the species within the claimed genus is required. We therefore reverse the written description rejection.

2. Utility

The examiner rejected all of the claims for lack of utility. The examiner bears the initial burden of showing that a claimed invention lacks patentable utility. See In re Brana, 51 F.3d 1560, 1566, 34 USPQ2d 1436, 1441 (Fed. Cir. 1995) ("Only after the PTO provides evidence showing that one of ordinary skill in the art would reasonably doubt the asserted utility does the burden shift to the applicant to provide rebuttal evidence sufficient to convince such a person of the invention's asserted utility.").

The seminal decision interpreting the utility requirement of § 101 is Brenner v. Manson, 383 U.S. 519, 148 USPQ 689 (1966). At issue in Brenner was a claim to "a chemical process which yields an already known product whose utility—other than as a possible object of scientific inquiry—ha[d] not yet been evidenced." Id. at 529, 148 USPQ at 693. The Patent Office had rejected the claimed process for lack of utility, on the basis that the product produced by the claimed process had not been shown to be useful. See id. at 521-22, 148 USPQ at 690. On appeal, the Court of Customs and Patent Appeals reversed, on the basis that "where a claimed process produces a known product it is not necessary to show utility for the product." Id. at 522, 148 USPQ at 691.

The Brenner Court noted that although § 101 requires that an invention be "useful," that "simple, everyday word can be pregnant with ambiguity when applied to the facts of life." Id. at 529, 148 USPQ at 693. Thus,

> [it] is not remarkable that differences arise as to how the test of usefulness is to be applied to chemical processes. Even if we knew precisely what Congress meant in 1790 when it devised the "new and useful" phraseology and in subsequent re-enactments of the test, we should have difficulty in applying it in the context of contemporary chemistry, where research is as comprehensive as man's grasp and where little or nothing is wholly beyond the pale of "utility"—if that word is given its broadest reach.

Id. at 530, 148 USPQ at 694.[2]

The Court, finding "no specific assistance in the legislative materials underlying § 101," based its analysis on "the general intent of Congress, the purposes of the patent system, and the implications of a decision one way or the other." Id. at 532, 148 USPQ at 695. The Court concluded that "[t]he basic quid pro quo contemplated by the

[2] The invention at issue in Brenner was a process, but the Court expressly noted that its holding "would

Constitution and the Congress for granting a patent monopoly is the benefit derived by the public from an invention with substantial utility. Unless and until a process is refined and developed to this point—where specific benefit exists in currently available form—there is insufficient justification for permitting an applicant to engross what may prove to be a broad field." Id. at 534-35, 148 USPQ at 695.

The Court considered and rejected the applicant's argument that attenuating the requirement of utility "would encourage inventors of new processes to publicize the event for the benefit of the entire scientific community, thus widening the search for uses and increasing the fund of scientific knowledge." The Court noted that, while there is value to encouraging disclosure, "a more compelling consideration is that a process patent in the chemical field, which has not been developed and pointed to the degree of specific utility, creates a monopoly of knowledge which should be granted only if clearly commanded by the statute. Until the process claim has been reduced to production of a product shown to be useful, the metes and bounds of that monopoly are not capable of precise delineation. It may engross a vast, unknown, and perhaps unknowable area. Such a patent may confer power to block off whole areas of scientific development." Id. at 534, 148 USPQ at 695.

The Court took pains to note that it did not "mean to disparage the importance of contributions to the fund of scientific information short of the invention of something 'useful,'" and that it was not "blind to the prospect that what now seems without 'use' may tomorrow command the grateful attention of the public." Id. at 535-36, 148 USPQ at 696. Those considerations did not sway the Court, however, because "a patent is not

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apply equally to the patenting of the product produced by the process." Id. at 535, 148 USPQ at 695-96.

a hunting license. It is not a reward for the search, but compensation for its successful conclusion." Id.

Subsequent decisions of the CCPA and the Court of Appeals for the Federal Circuit have added further layers of judicial gloss to the meaning of § 101's utility requirement. The first opinion of the CCPA applying Brenner was In re Kirk, 376 F.2d 936, 153 USPQ 48 (CCPA 1967). The invention claimed in Kirk was a set of steroid derivatives said to have valuable biological properties and to be of value "in the furtherance of steroidal research and in the application of steroidal materials to veterinary or medical practice." Id. at 938, 153 USPQ at 50. The claims had been rejected for lack of utility. In response, the applicants submitted an affidavit which purportedly "show[ed] that one skilled in the art would be able to determine the biological uses of the claimed compounds by routine tests." Id. at 939, 153 USPQ at 51.

The court held that "nebulous expressions [like] 'biological activity' or 'biological properties'" did not adequately convey how to use the claimed compounds. Id. at 941, 153 USPQ at 52. Nor did the applicants' affidavit help their case: "the sum and substance of the affidavit appear[ed] to be that one of ordinary skill in the art would know 'how to use' the compounds to find out in the first instance whether the compounds are—or are not—in fact useful or possess useful properties, and to ascertain what those properties are." Id. at 942, 153 USPQ at 53.

The Kirk court held that an earlier CCPA decision, holding that a chemical compound meets the requirements of § 101 if it is useful to chemists doing research on steroids, had effectively been overruled by Brenner. "There can be no doubt that the

insubstantial, superficial nature of vague, general disclosures or arguments of 'useful in research' or 'useful as building blocks of value to the researcher' was recognized, and clearly rejected, by the Supreme Court" in Brenner. See Kirk, 376 F.2d at 945, 153 USPQ at 55.

More recently, in In re Ziegler, 992 F.2d 1197, 26 USPQ2d 1600 (Fed. Cir. 1993), the Federal Circuit considered the degree of specificity required to show utility for a claim to polypropylene. The U.S. application on appeal in Ziegler claimed priority to a German application filed in 1954. "In the German application, Ziegler disclosed only that solid granules of polypropylene could be pressed into a flexible film with a characteristic infrared spectrum and that the polypropylene was 'plastic-like.'" Id. at 1203, 26 USPQ2d at 1605. "Ziegler did not assert any practical use for the polypropylene or its film, and Ziegler did not disclose any characteristics of the polypropylene or its film that demonstrated its utility." Id. The court held that the German application did not satisfy the requirements of § 101 and therefore could not be relied on to overcome a rejection based on an intervening reference. See id., 26 USPQ2d at 1606. "[At] best, Ziegler was on the way to discovering a practical utility for polypropylene at the time of the filing of the German application; but in that application Ziegler had not yet gotten there." Id., 26 USPQ2d at 1605.

On the other hand, the CCPA reversed a rejection for lack of utility in In re Jolles, 628 F.2d 1322, 206 USPQ 885 (CCPA 1980). The applicant in Jolles claimed pharmaceutical compositions that were disclosed to be useful in treating acute myeloblastic leukemia. See id. at 1323, 206 USPQ at 886. The active ingredients in the compositions were closely related to daunorubicin and doxorubicin, both of which

were "well recognized in the art as valuable for use in cancer chemotherapy." Id., 206 USPQ at 887. The applicant also submitted declaratory evidence showing that eight of the claimed compositions were effective in treating tumors in a mouse model, and one was effective in treating humans. See id. at 1323-24, 206 USPQ at 887-88. The court noted that the data derived from the mouse model were "relevant to the treatment of humans and [were] not to be disregarded," id. at 1327, 206 USPQ at 890, and held that the evidence was sufficient to support the asserted therapeutic utility. See id. at 1327-28, 206 USPQ at 891.

The Federal Circuit held in Cross v. Iizuka, 753 F.2d 1040, 224 USPQ 739 (Fed. Cir. 1985), that in vivo testing (as in Jolles) was not necessarily required to show utility in the pharmaceutical context. The Cross court stated that "[it] is axiomatic that an invention cannot be considered 'useful,' in the sense that a patent can be granted on it, unless substantial or practical utility for the invention has been discovered and disclosed where such utility would not be obvious." Id. at 1044, 224 USPQ at 742 (citing Brenner v. Manson). The court "perceive[d] no insurmountable difficulty, under appropriate circumstances, in finding that the first link in the screening chain, in vitro testing, may establish a practical utility for the compound in question." Id. at 1051, 224 USPQ at 748. Successful in vitro testing could provide an immediate benefit to the public, by "marshal[ling] resources and direct[ing] the expenditure of effort to further in vivo testing of the most potent compounds . . ., analogous to the benefit provided by the showing of an in vivo utility." Id. On the facts of that case – successful in vitro testing supplemented by similar in vitro and in vivo activities of structurally similar compounds – the court held that in vitro activity was sufficient to meet the requirements of § 101. See id.

The Federal Circuit confirmed in In re Brana, 51 F.3d 1560, 34 USPQ2d 1436 (Fed. Cir. 1995), that human testing is not necessary to establish utility for a method of treatment. The invention claimed in Brana was a group of compounds disclosed to have antitumor activity. See id. at 1562, 34 USPQ2d at 1437-38. The claimed compounds were disclosed to have higher antitumor activity than related compounds known to have antitumor activity, and the applicants provided declaratory evidence of in vivo activity against tumors in a mouse model. See id., 34 USPQ2d at 1438. The court held that these data were sufficient to satisfy § 101; usefulness in patent law does not require that the invention be ready to be administered to humans. See id. at 1567, 34 USPQ2d at 1442.

Several lessons can be drawn from Brenner and its progeny. First, § 101's requirement that an invention be "useful" is not to be given its broadest reach, such that little or nothing of a chemical nature would be found to lack utility. See Brenner, 383 U.S. at 530, 148 USPQ at 694. Thus, not every "use" that can be asserted will be sufficient to satisfy § 101. For example, the steroid compound at issue in Brenner was useful as a possible object of scientific inquiry, and the polypropylene claimed in Ziegler was useful for pressing into a flexible film, yet both lacked sufficient utility to satisfy § 101. See Brenner, 383 U.S. at 529, 148 USPQ at 696; Ziegler, 992 F.2d at 1203, 26 USPQ2d at 1605.

Rather than setting a de minimis standard, § 101 requires a utility that is "substantial", i.e., one that provides a specific benefit in currently available form. Brenner, 383 U.S. at 534-35, 148 USPQ at 695. This standard has been found to be met by pharmaceutical compositions shown to be useful in mouse models and in

humans for treating acute myeloblastic leukemia (Jolles, 628 F.2d at 1327-28, 206 USPQ at 891); by evidence showing successful in vitro testing supplemented by similar in vitro and in vivo activities of structurally similar compounds (Cross, 753 F.2d at 1051, 224 USPQ at 748); and by evidence showing in vivo antitumor activity in mice, combined with a disclosure that the claimed compounds had higher antitumor activity than a related compound known to have antitumor activity (Brana, 51 F.3d at 1567, 34 USPQ2d at 1442).

By contrast, Brenner's standard has been interpreted to mean that "vague, general disclosures or arguments of 'useful in research' or 'useful as building blocks of value to the researcher'" would not satisfy § 101. See Kirk, 376 F.2d at 945, 153 USPQ at 55 (interpreting Brenner). Likewise, a disclosure of a "plastic-like" polypropylene capable of being pressed into a flexible film was held to show that the applicant was "at best . . . on the way to discovering a practical utility for polypropylene at the time of the filing," but not yet there. Ziegler, 992 F.2d at 1203, 26 USPQ2d at 1605.

In this case, the examiner found the specification's disclosure to be inadequate:

> The specification does not disclose any information regarding ligands or functional characteristics/mechanisms of action of NHPs. The specification fails to disclose the physiological effects that occur when NHP binds its receptor. The specification does not disclose a receptor for NHP. Ligand-binding experiments and/or second-messenger assays were never executed to conclusively discern a function for NHP.

Examiner's Answer, page 4.[3] The examiner noted that the "specification asserts several utilities," but concluded that none of them satisfies § 101. See id., pages 5-6:

[3] The examiner also criticized the specification's reliance on sequence similarity as a basis for inferring the function of the claimed NHP. See the Examiner's Answer, pages 4-5. Appellant argues that sequence comparisons are well-accepted, although perhaps not universally accepted, in the art as a reasonable basis on which to predict function. See the Appeal Brief, pages 9-13. We need not decide the

> Some of the asserted utilities include methods to screen for agonists and/or antagonists of NHP, using probes to isolate other cDNAs, screening for binding proteins and making antibodies. . . . A specific utility amounts to more than a starting point for further research and investigation. It does not require or constitute carrying out further research to identify or reasonably confirm what the practical use might ultimately be.
>
> The specification states that a variety of methods can be employed for the diagnostic and prognostic evaluation of disorders related to NHP function. The specification establishes no connection between any disease/condition. . . . The specification . . . fails to disclose that the DNA of the instant application can be linked to a specific disease or gene regulating activity.

Appellant argues that the specification's characterization of the claimed nucleic acids as encoding a member of the PDGF family is sufficient to establish their utility. See the Appeal Brief, page 10: "[T]here can be no question that those skilled in the art would clearly believe that Appellants' [sic] sequence is a member of the platelet derived growth factor family. Thus, the present claims clearly meet the requirements of 35 U.S.C. § 101."

We do not agree that the characterization of the protein encoded by the claimed nucleic acids as a member of the PDGF family is sufficient to establish patentable utility. Appellant's specification discloses no information regarding the activity or function of the protein encoded by the claimed polynucleotides, the function(s) of the protein(s) with which it shares structural similarity, the cell type(s) or receptor(s) with which any of these proteins interact, or the nature of that interaction.

As the specification discloses, "secreted proteins . . . are often involved in regulating and maintaining a wide variety of biological and physiological processes.

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issue because even assuming Appellant is correct, the specification does not adequately disclose the utility of the claimed nucleic acids.

Often, such processes are mediated by protein ligands that interact with corresponding membrane receptor proteins that activate signal transduction and other pathways that control cell physiology, chemical release and communication, and gene expression." Page 1 (emphasis added). See also page 7: "In addition to the genes encoding PDGF and VEGF family proteins, the NHPs [sic] described in SEQ ID NO:7 shares significant similarity to a variety of CUB domain proteins such as bone morphogenetic protein, C-proteinases and endopeptidases, neuropilin, human NP-2, semaphorin, sperm adhesins, bovine acidic seminal fluid protein, and other secretory proteins." The specification does not disclose what significance, if any, the "significant similarity" of SEQ ID NO:7 to this "variety" of proteins has with regard to its function.

Therefore, we agree with the examiner that the evidence does not support Appellant's position that the identification of SEQ ID NO:7 as a member of the PDGF family, without more, provides a substantial utility for the claimed invention. In the terms used in Brenner, such a characterization does not provide a specific utility in currently available form. We therefore reject Appellant's argument that § 101 is satisfied by SEQ ID NO:7's "structural similarity" to members of the PDGF family of proteins.

Appellant also argues that the claimed polynucleotide are useful because of the disclosed polymorphism at position 598 of SEQ ID NO:6; "[a]s polymorphisms such as this are the basis for forensic analysis, which is undoubtedly a 'real world' utility, the presently claimed sequence must in itself be useful." Appeal Brief, page 5. More specifically, Appellant argues that

> [n]aturally occurring genetic polymorphisms such as that described in the present specification are both the basis of, and critical to, inter alia, forensic genetic analysis intended to resolve issues of, for example,

> identity or paternity. . . . These are all well known and generally accepted uses of identified polymorphisms such as the polymorphism identified by Appellants [sic].

Id. The lack of information regarding biological function is irrelevant to this utility, Appellant argues, because "forensic analysis does not require any information at all about the ultimate biological function of the encoded protein." Id., page 6.

Appellant, however, cites no evidence in either the specification or other evidence of record to support this argument. Although the specification discloses the presence of a polymorphism in SEQ ID NO:6 (pages 7-8), it does not disclose that detection of the polymorphism is useful for forensic analysis, paternity testing, or anything else. Nor has Appellant cited any evidence of record to show that such uses were well-established as of the effective filing date of the present application (October 18, 1999). Finally, Appellant has provided no evidence to show that those skilled in the art would have found the specific polymorphism present in SEQ ID NO:6 – without analysis of its degree of variability in the human population and without associating it with any other genetic marker – to be useful as argued. Thus, polymorphism-based utilities asserted in the Appeal Brief lack evidentiary support and cannot be relied on to overcome the rejection.

In addition to the polymorphism-based argument, Appellant also argues that

> given the well established biological and medical relevance of platelet derived growth factor proteins, those skilled in the art would readily appreciate the importance of tracking the expression of the genes. . . . In particular, the specification describes how the described sequences can be represented using a gene chip format to provide a high throughput analysis of the level of gene expression. Such "DNA chips" clearly have utility, as evidenced by hundreds of issued U.S. Patents. . . . Clearly,

> compositions that enhance the utility of such DNA chips, such as the presently claimed nucleotide sequences, must in themselves be useful.

Appeal Brief, pages 13-14.

Appellant argues that, in addition to their use in "DNA chips", the claimed sequences are also useful "in 'determining the genomic structure,' for example in the identification of coding sequence and mapping the gene to a particular chromosome." Id., page 15. More particularly, Appellant argues that

> [t]he presently claimed polynucleotide sequence provides biologically validated empirical data (e.g., showing which sequences are transcribed, spliced, and polyadenylated) that specifically define that portion of the corresponding genomic locus that actually encodes exon sequence.

Id. Appellant argues that "the described sequences are useful for functionally defining exon splice-junctions," and that "the practical scientific value of biologically validated expressed, spliced, and polyadenylated mRNA sequences is readily apparent to those skilled in the relevant biological and biochemical arts." Id., page 16.

We are not persuaded by Appellant's argument. We find that the asserted uses of the claimed polynucleotides—as a component of a DNA chip for monitoring gene expression, as a marker for a given chromosomal locus, or for defining the exon splice-junctions of a gene—do not satisfy the utility requirement of § 101. Such uses do not provide a specific benefit in currently available form.

For example, with regard to the asserted "DNA chip" utility, we accept for argument's sake that a person skilled in the art could attach one of the claimed polynucleotides (or a part of it) to a solid substrate, in combination with other polynucleotides, to form a DNA chip, and that such a DNA chip could be used to monitor changes in expression of the corresponding gene. However, the specification

provides no guidance to allow a skilled artisan to use data relating to the expression of the gene comprising SEQ ID NO:6 in any practical way. The specification provides no guidance regarding what the SEQ ID NO:6-specific information derived from a DNA chip would mean.

For example, assume that a fragment of SEQ ID NO:6 was attached to a DNA chip and the researcher observed that expression of the corresponding gene was increased when a cell was treated with a particular agent. The specification provides no basis on which a skilled worker would be able to determine what, if anything, that result means. Perhaps a change in expression of the gene would mean different things, depending on other factors, but again the specification provides no hint what other factors might be important. Would it depend on what agent is used, what cell type is used, the behavior of other genes (if so, which genes and what behavior is significant), or the degree of increase? Because the specification provides no information about the activity of the protein encoded by SEQ ID NO:6, it provides no guidance as to how to interpret the results of a DNA chip-based gene expression assay based on the claimed polynucleotides.

The same problem afflicts Appellant's assertions that the claimed polynucleotides can be used to map a particular chromosomal locus or to define the exon splice-junctions of the genomic gene: the specification provides no meaningful guidance regarding how to use such information in any practical way. What would it mean, for example, if SEQ ID NO:6 hybridizes to a specific part of human chromosome 4, or if SEQ ID NO:6 can be used to show that the chromosomal gene has an exon splice junction between nucleotides 103 and 104? The specification provides no guidance on

how such information would allow those skilled in the art to use the claimed polynucleotides in a specific, substantial way. By contrast, if the specification disclosed, for example, that SEQ ID NO:6 hybridized adjacent to a chromosomal locus associated with a known disease (e.g., a locus susceptible to a cancer-causing translocation), the sequence would have an apparent utility in disease diagnosis. However, without disclosure of a specific use for the resulting data, using the claimed sequences for mapping or determining exon splice-junctions amounts to research on the claimed polynucleotides themselves.

In effect, Appellant's position is that the claimed polynucleotides are useful because those of skill in the art could experiment with them and figure out for themselves what any observed experimental results might mean. We do not agree that such a disclosure provides a "specific benefit in currently available form." Rather, the instant case seems analogous to Brenner. In Brenner, the applicant claimed a method of making a compound but disclosed no utility for the compound. 383 U.S. at 529, 148 USPQ at 693. The Court held that a process lacks utility if it produces a product that lacks utility. Id. at 534, 148 USPQ at 695. Here, Appellant claims a product asserted to be useful in a method of generating gene-expression or gene-mapping data, but the specification does not disclose how to interpret those data. Just as the process claimed in Brenner lacked utility because the specification did not disclose how to use the end-product, the product claims here lack utility, based on their use in, e.g., DNA chips, because the specification does not disclose how to use the SEQ ID NO:6-specific gene expression data generated by a DNA chip.

Appellant argues that the claimed polynucleotides could potentially be part of a DNA chip; since DNA chips have utility, compounds that "enhance the utility of such DNA chips, such as the presently claimed nucleotide sequences, must in themselves be useful." Appeal Brief, pages 13-14 (emphasis in original). We disagree.

Assuming arguendo that a generic DNA chip—one comprising a collection of uncharacterized or semi-characterized gene fragments—would provide a useful tool for, e.g., drug discovery, it does not follow that each one of the polynucleotides represented in the DNA chip individually has patentable utility. Although each polynucleotide in the DNA chip contributes to the data generated by the DNA chip overall, the contribution of a single polynucleotide—its data point—is only a tiny contribution to the overall picture.

The Brenner Court held that § 101 sets more than a de minimis standard for utility. Therefore, the patentable utility of a DNA chip, for example, does not necessarily mean that every one of the components of the DNA chip also has patentable utility. A patentable utility divided by a thousand does not necessarily equal a thousand patentable utilities. Each claimed invention must be shown to meet § 101's utility requirement in order to be patentable; it must provide a specific benefit in currently available form. Providing a single data point among thousands, even if the thousands of data points collectively are useful, does not meet this standard.

The Supreme Court noted that the patent system contemplates a basic quid pro quo: in exchange for the legal right to exclude others from his invention for a period of time, an inventor discloses his invention to the public. See Brenner, 383 U.S. at 534, 148 USPQ at 695. The Brenner Court held that the grant of patent rights to an applicant is justified only by disclosure of an invention with substantial utility – a specific benefit in

currently available form. Until the invention has been refined and developed to this point, the Court held, the applicant has not met his side of the bargain, and has not provided a disclosure that justifies granting him the right to exclude others. See id.

Thus, the basic quid pro quo of the patent system is the grant of a valuable legal right in exchange for a meaningful disclosure of the claimed invention. In this case, the generic utilities disclosed for the claimed products do not entitle Appellant to the legal right he claims to exclude others from using those products.

We note that this application is one of several on appeal that share the same assignee.[4] In each of these cases, regardless of the specific facts of the case, the Appellant have asserted the same DNA chip, gene-mapping, and exon splice junction arguments. It would therefore appear that the assignee views these potential uses as utilities that can be asserted for any isolated cDNA, regardless of how little is known about it, which (it is hoped) will nonetheless serve as a basis for patent protection and secure for the assignee any value that might become apparent in the future, after the claimed products are further characterized. This is precisely the type of result that the Brenner Court sought to avoid by requiring disclosure of a substantial utility to satisfy § 101. See 148 U.S. at 535-36, 148 USPQ at 696: [The Court was not] "blind to the prospect that what now seems without 'use' may tomorrow command the grateful attention of the public. But a patent is not a hunting license. It is not a reward for the search, but compensation for its successful conclusion." Id.

[4] Such applications include 09/460,594 (Appeal No. 2003-1528), 09/804,969 (2003-1794); 09/802,116 (2003-2017); 09/822,807 (2003-2028); and 09/564,557 (2004-0343).

The polynucleotides of the instant claims may indeed prove to be useful (and valuable), after the in vivo role of the encoded protein is discovered. The work required to confer value on the claimed products, however, remains to be done. The instant specification's disclosure does not justify a grant of patent rights. See Brenner, 383 U.S. at 534, 148 USPQ at 695: "[A] process patent in the chemical field, which has not been developed and pointed to the degree of specific utility, creates a monopoly of knowledge which should be granted only if clearly commanded by the statute. Until the process claim has been reduced to production of a product shown to be useful, the metes and bounds of that monopoly are not capable of precise delineation. It may engross a vast, unknown, and perhaps unknowable area. Such a patent may confer power to block off whole areas of scientific development." We consider the Brenner Court's concern about the "power to block off whole areas of scientific development" to be equally applicable here.

Finally, adopting the per se rule that Appellant seeks—that any expressed human gene has utility because it can be used in a DNA chip—would mean that almost any naturally occurring nucleic acid would be patentable. It is unclear what, if anything, limits Appellant's proposed rule. Appellant's reasoning does not depend on the biological function of the protein encoded by the claimed nucleic acids, and so would apparently apply to any expressed human gene, as well as fragments of them (see, e.g., the specification at page 8, lines 24-32).

Nor can the rationale be confined to expressed human genes. We can take judicial notice of the fact that other organisms are of interest for many different reasons, such that gene expression assays could conceivably be used in their research. For

example, some organisms are of interest to researchers because they have been historically well-studied (e.g., yeast and Arabidopsis). Others are of interest because they are used as animal models (e.g., mice and chimpanzees), because they are commercially valuable (e.g., pigs and tomatoes), because they are pests (e.g., ragweed and corn borers), or because they are pathogens (e.g., Candida and various bacteria). Under Appellant's proposed rule, hybridizable fragment of any gene of any of these organisms—and probably most other organisms—would be found to have patentable utility because it could be attached to a chip and used in "research" to see what happens to expression of that gene under various conditions.

Appellant's reasoning would also vitiate the enablement requirement, since "[t]he enablement requirement is met if the description enables any mode of making and using the invention." Johns Hopkins Univ. v. CellPro Inc., 152 F.3d 1342, 1361, 47 USPQ2d 1705, 1714 (Fed. Cir. 1998) (quoting Engel Indus., Inc. v. Lockformer Co., 946 F.2d 1528, 1533, 20 USPQ2d 1300, 1304 (Fed. Cir. 1991)). If we were to agree with Appellant that any expressed gene and any hybridizable fragment thereof is useful in a DNA chip, then we would also have to hold that the specification has taught those skilled in the art one mode of using the invention. Thus, Appellant's rule of per se utility would also require a corresponding rule of per se enablement.

Under Appellant's rule, then, any polynucleotide from an expressed gene would be patentable if it was adequately described in the specification and was not disclosed or suggested in the prior art. This standard, however, is not the one set by Congress, which requires that a patentable invention also be useful and fully enabled, nor is it the standard that has been consistently applied by the courts.

In addition, the flood of DNA patents that would result from adoption of Appellant's rule could doom the potential contribution of microarrays to biological research. Appellant argues that "[g]iven the widespread utility of such 'gene chip' methods using public domain gene sequence information, there can be little doubt that the use of the presently described novel sequences would have great utility." Appeal Brief, page 13. See also page 14: "[T]here is an entire industry established based on the use of gene sequences or fragments thereof in a gene chip format."

The practical effect of Appellant's utility standard, however, would be that making a microarray with 1000 genes represented on it would require investigating each of the DNA sequences (and subsequences) on the gene chip to ensure that it was not the subject of someone else's patent. For each of the DNAs that was the subject of someone else's patent claim, a license would have to be negotiated – potentially thousands of such negotiations for the finished product. These transaction costs would have to be incurred for each new product that an aspiring gene chip manufacturer wished to market. The industry gridlock likely to result has been termed a "tragedy of the anticommons":

> By conferring monopolies in discoveries, patents necessarily increase prices and restrict use—a cost society pays to motivate invention and disclosure. The tragedy of the anticommons refers to the more complex obstacles that arise when a user needs access to multiple patented inputs to create a single useful product. Each upstream patent allows its owner to set up another tollbooth on the road to product development, adding to the cost and slowing the pace of downstream biomedical innovation.

Heller, page 698.[5]

[5] Heller et al., "Can patents deter innovation? The anticommons in biomedical research," Science, Vol. 280, pp. 698-701 (1998). Accessible online at www.sciencemag.org/cgi/content/full/280/5364/698.

The Supreme Court has warned against allowing too many "tollbooths" on the road to innovation:

> Patents . . . are meant to encourage invention by rewarding the inventor with the right, limited to a term of years fixed by the patent, to exclude others from the use of his invention. . . . But in rewarding useful invention, the "rights and welfare of the community must be fairly dealt with and effectually guarded." Kendall v. Winsor, 21 How. 322, 329 (1859). . . . To begin with, a genuine "invention" or "discovery" must be demonstrated "lest in the constant demand for new appliances the heavy hand of tribute be laid on each slight technological advance in an art."

Sears, Roebuck & Co. v. Stiffel Co., 376 U.S. 225, 230, 140 USPQ 524, 527 (1964).

The basic quid pro quo of the patent system requires disclosure of an invention having substantial utility. Appellant's disclosure in this case does not provide a specific benefit in currently available form, and therefore lacks the substantial utility required by 35 U.S.C. § 101. We therefore affirm the rejections for lack of utility.

Summary

We reverse the rejection of claim 4 but affirm the rejection of all the claims under 35 U.S.C. §§ 101 and 112, first paragraph, for lack of utility. Since we conclude that all of the claims are nonenabled for lack of utility, we need not reach the separate rejection of claims 4, 7, and 8 for nonenablement.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED

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Administrative Patent Judge)
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)
Toni R. Scheiner) BOARD OF PATENT
Administrative Patent Judge) APPEALS AND
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Eric Grimes)
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